# FIRESCAPE

## LANDSCAPING TO REDUCE FIRE HAZARD

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*Fire affects everyone living in California. This brochure is intended as a guide for residents and landscape professionals of fire-prone areas in the East Bay hills. Following these guidelines will reduce fire hazard, but cannot guarantee fire safety. Local ordinances vary; check with your local government or fire department for regulations. For further information, see the resource list at the back of this brochure.*

May 2003, Fifth Edition

***Wildfires are part of California's natural ecosystem.***
The summer-dry climate and rugged topography, combined with native vegetation that is adapted to fire, set the stage for periodic burns.

The natural tendency of wildlands to burn is aggravated by the build-up of vegetation from decades of fire suppression to protect lives and property. Wildlands that historically burned frequently with little damage now have greatly increased potential for catastrophic fires.

Adding to the danger, California's population is growing, its urban and suburban areas are expanding, and more people are building homes in and adjacent to wildlands.

Thousands of homes are threatened by wildfire each year, largely because of the intermixing of housing and human activity with undeveloped or lightly developed open space in the "urban-wildland interface."

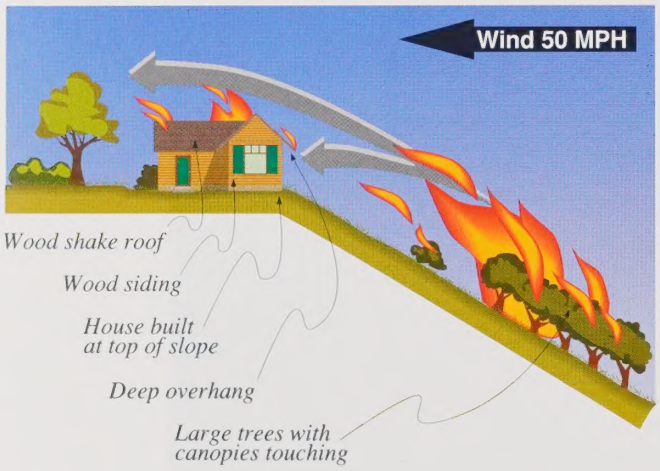
The best strategy for minimizing costly damage from wildfires is to manage, on a long-term basis, the structural conditions that fuel a fire. Factors to consider include:

- character of the natural and built environment
- building location, design, and materials
- landscape design
- irrigation system
- ongoing maintenance

*Hillside homes near wildlands are most at risk.*

***Where you live affects your vulnerability to fire.*** Begin by assessing the hazards in your surroundings. Is your home on a grassy hillside or in a wooded canyon? Fire tends to travel fastest uphill by preheating dried vegetation from below and making it easier to ignite. The steeper the slope, the faster a fire will spread. Narrow canyons and saddles act as chimneys that trap heat, channel wind, and create erratic fire behavior. Ridges are also fire-prone. Heavily vegetated slopes are particularly hazardous.

***Dangerous materials and conditions for sloped sites***

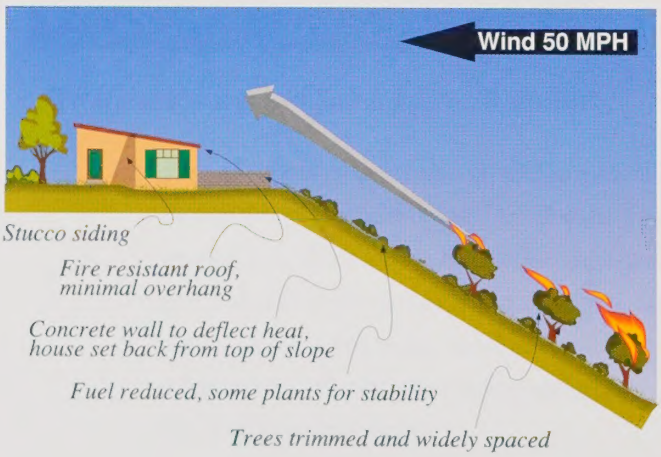



Note the direction of prevailing winds, as well as the likely direction of those hot, dry "Diablo" winds that occur less frequently but create the worst of our "fire weather." Areas most affected by winds should have a larger clearance.

Fire can travel downhill if winds are strong. Once a wildfire gets big enough, it generates its own wind and can move in any direction. Burning embers or "firebrands" can be blown far from the main front of a large fire, lodging in trees, landing on roofs, and spreading fire to new locations.

■ Consider how fires typically behave when assessing your risk. Homes should be set back from the top of a hillside. The steeper the slope, the greater the setback required to keep flames, brands, and convection winds away from your home. Homes at the bottom of a slope also should have as much setback as possible.

***Landscaping and structures designed for fire safety***



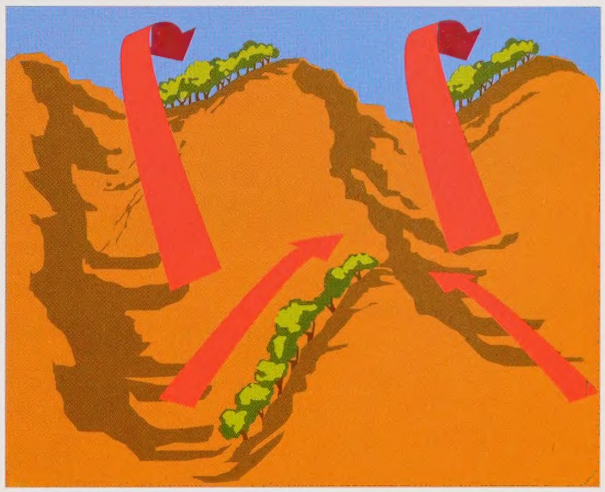

■ If your house is sited in a dangerous location, there are steps you can take to increase your chances of avoiding a disastrous fire. Consider constructing a stone or concrete wall between your house and the most likely path of approaching fire to help deflect flames, heat, and burning embers away from the house. This is also a good place to install a lawn, a pool, or a patio of non-flammable materials such as concrete, brick, or stone.

*Check with your local fire department to find out how your neighborhood is rated with respect to fire hazard. The higher the hazard, the more you need to do to increase the chances of your home surviving a wildfire.*

- Vegetation on slopes should be low in both height and volume, but should not be completely eliminated because bare slopes may be subject to erosion and instability. A good slope planting consists of widely spaced deep-rooted shrubs interspersed with mulch or low-growing groundcovers.

Fire hazard reduction is important in flatter areas as well as on slopes, since fires can start anywhere and spread by windblown firebrands from one area to another.

Fire shows no respect for property lines. Fire hazard in residential areas is established by evaluating the characteristics of neighborhoods. How many nearby homes have combustible roofing, siding, decking, or fencing? Are structures and vegetation arranged in such a way that fire can travel easily from one home to the next? What is the total volume of vegetation in the area, and is there vertical continuity from grasses and low groundcovers to medium and large shrubs to the canopies of tall trees?



***Ridges and canyons channel wind and fire.***

- Talk to neighbors about firewise landscaping. Work together to develop and implement a fuel reduction plan that benefits the entire neighborhood.

- Keep an eye out for conditions or activities that can threaten the neighborhood, such as roofs covered with pine needles, uncovered woodpiles or dense vegetation adjacent to homes or wood fences, tall weeds left unmowed, or flammable liquids improperly used or stored.

- Common spaces or greenbelts between homes and housing areas can be designed to minimize fire risk. Low groundcovers or rock mulches with widely spaced trees and shrubs are safest for these areas.

*"Fuels" include buildings, decks, and fences, as well as trees, shrubs, and other flammable materials, and any combination of fuels can create a "fire path" or "fire ladder."*

***Building design is an important factor in fire safety.*** Consider fire safety when remodeling your home. Look for anything that might be a fuel source or fire trap. Homes with many nooks and crannies are at higher risk than are low-profile structures with simple detailing. Short overhangs and boxed-in eaves provide less for flames to attack. Exterior materials such as stucco, stone, concrete, and steel are more fire-resistant than wood. Wood siding and shingles are particularly hazardous. Balconies and decks can ignite from beneath. Fire also can enter the house through unscreened attic and foundation vents.

Flammable roofs are the number one cause of home losses in wildfires. Installing a fire-resistant roof may be the single most important step you can take to protect your home from wildfire. Roofing materials are rated for fire resistance. Class A is the top rating, followed by classes B and C. Ratings take into account not only the material used, but the method of construction.

Walls, windows, and decking also vary in performance when exposed to fire. For example, smaller windows, double-paned windows, and tempered glass are generally more resistant to breakage when exposed to radiant heat or flying brands. The highest priority for fire-resistant windows is on the ground floor facing the most likely direction of approaching wildfire.

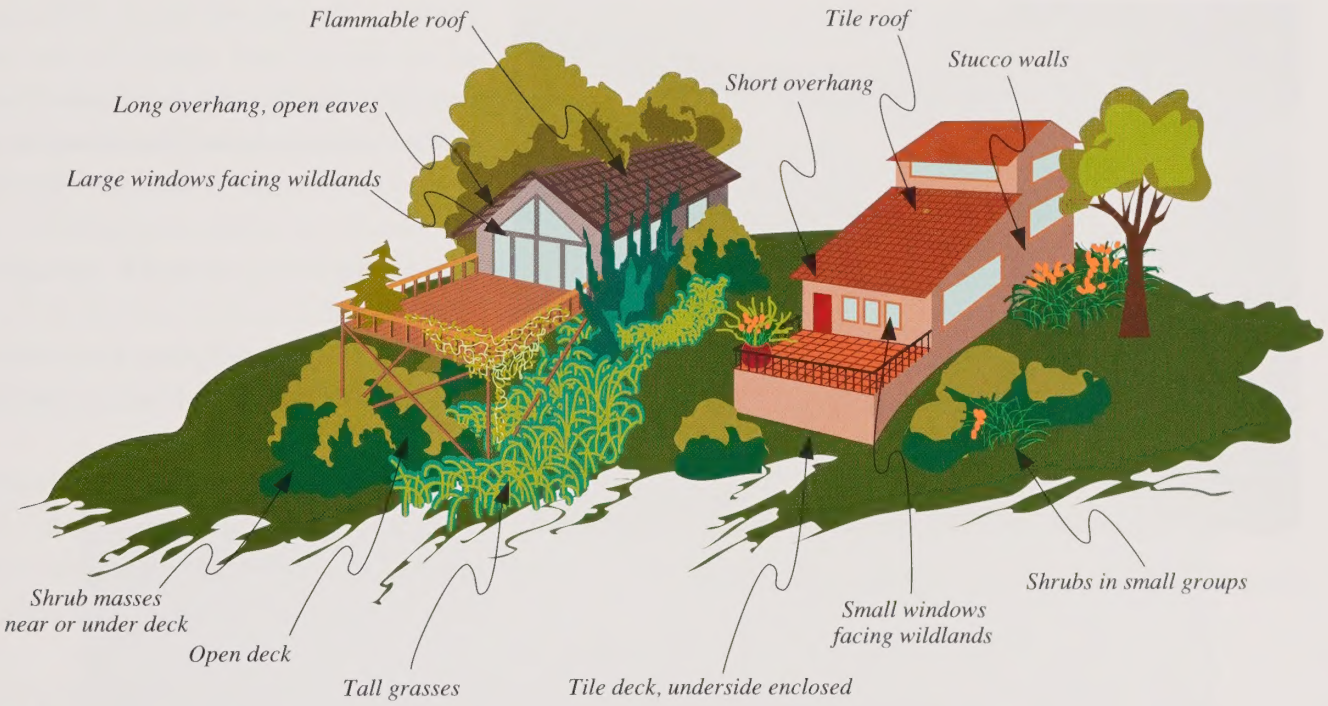
Fire safety professionals continue to conduct research and test various construction materials and methods. Building codes may or may not reflect the latest research findings. You may have to search the internet, check the library, or make some phone calls to be sure you have the most current information (see Resources, page 15).

- Consult the University of California Forest Products Laboratory website for the latest results of fire performance tests of roofs, walls, windows, and decks using various building materials and construction techniques.

- Check with local fire officials and the city or county building department for requirements and codes specific to your area.

***rrangement and spacing of vegetation are critical.***

Wildfires throughout California in recent years attest to the destructive potential of flammable vegetation adjacent to homes and other structures, especially in hilly suburban and semi-rural areas. Two primary principles guide firewise landscape design: fuel reduction and interruption of the "fire path"– the horizontal or vertical continuity of fuel.

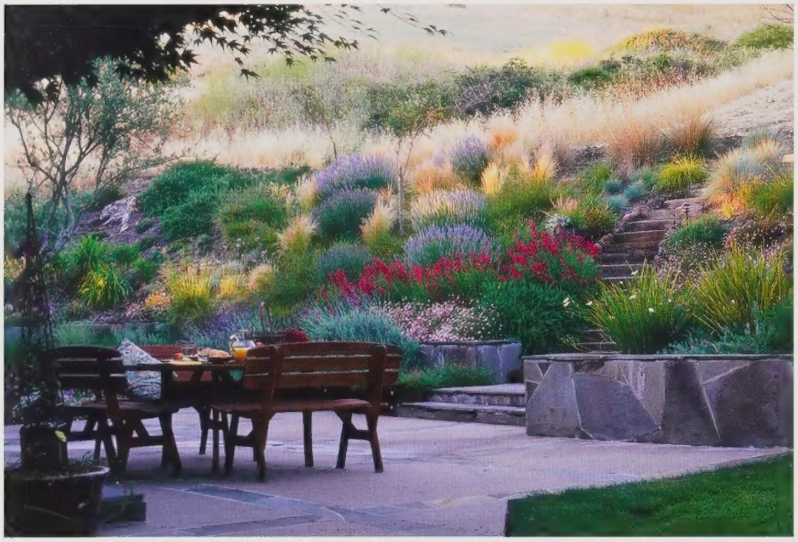



■ Fuel reduction should consider both the overall amount of fuel in the area and the flame length associated with fuel sources of different heights. In general, low-growing vegetation such as grasses and groundcovers will produce flames a few feet high, while trees can burn with flames that are fifty to seventy-five feet high and wide or more.

■ Interruption of the fire path requires physical separation of fuel sources, both vertically and horizontally. Fire spreads rapidly along the ground or upward if it can move without interruption from one shrub or tree to another or from low grasses to mid-sized shrubs to taller trees. Potential fire paths and "fire ladders" can be minimized through ongoing maintenance of a landscape designed with fire safety in mind.

***Landscape zones can enhance your defensible space.***

The concept of zoning, with increasing attention to fire safety in zones closer to the house, is central to firewise landscape design. Fire safety professionals recommend at least a thirty-foot "defensible space" around homes, and state law requires this in hazardous areas. Landscapes can be designed to provide defensible space and reduce fire hazard.



*Zone 1 is a good place for patios and a small lawn.*

**Zone 1** is the innermost zone, within thirty feet of the house, and should be the most fire-resistant. Ideally, no vegetation over a few inches high should be planted within six feet of the house or under a deck or other overhang. Firewood and other combustible materials should not be stored in this critical area.

- Zone 1 is a good place for a lawn, a pool, or a patio of concrete, brick, or paving stones.

- Decomposed granite or gravel mulches are good choices for this zone. Bark chips help retain soil moisture, but they are combustible and provide fuel for smoldering embers.

- Plantings in this zone should be mostly low-growing shrubs and groundcovers. Trees, if any, should be small and "clean" – that is, they should not accumulate or drop more dead material than can be consistently removed from the site.

**Zone 2** is a transition zone on larger lots. This is the space between manicured gardens adjacent to the house and fringe areas abutting open space or between groups of houses surrounded by open space.

- Zone 2 is a good place for drought-tolerant groundcovers and low shrubs on drip irrigation.

- Larger shrubs and trees in this zone should be planted in widely spaced groups separated by areas of mulch or low groundcovers that break up the path of fire.

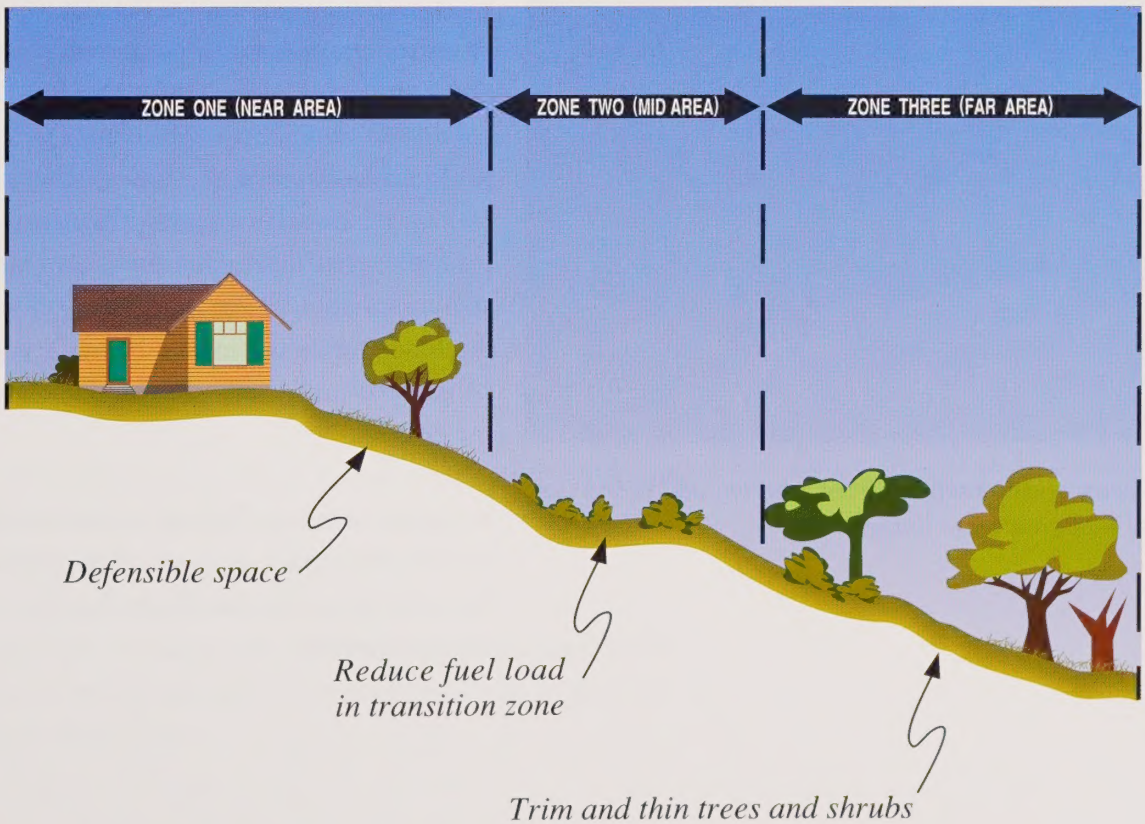
- Spacing should be adequate both vertically and horizontally. Avoid any arrangement that facilitates movement of fire along the ground or from the ground up into the house or tree canopy.

- Walkways through this zone can help separate planting areas while also simplifying maintenance. Walkways should be four to five feet wide and may be gravel, brick, concrete, compacted earth, or decomposed granite.

*California state law requires a 30- to 100-foot firebreak around structures and other protective measures in designated high-fire-hazard zones. See Resources on page 15.*

**Zone 3** may be the area furthest from the home on large lots, or it may consist of adjacent wildlands. Vegetation here may include larger trees and shrubs and native vegetation.

- Plants in Zone 3 may not be irrigated, but they should be well maintained. As in Zone 2, larger plants should be spaced widely and interspersed with lower plantings. The taller the plants, the more widely they should be spaced.



## Some other firewise landscape design ideas

- Consider alternatives to wood fences, including concrete or rock walls. Wood fences provide pathways for fire to race toward homes and through neighborhoods. Wire mesh fencing can reduce fuel mass while also preserving views.

- Where feasible, install patios of non-flammable materials such as concrete or brick instead of wood decking. If wood is the building material of choice, remember that larger timbers burn more slowly. The undersides of wood decks or balconies should be enclosed with a fire-resistant skirting to prevent wind-blown flames from being drawn up into them.

- Avoid planting shrubs or trees in rows or hedges, since this can provide an uninterrupted path for fire. Discrete "islands" of plants are less likely to spread a fire. Ideally, island width should be no more than two times the height of shrubs and at least that distance apart.

*Invasive weeds such as French broom add to the fuel load and create fire ladders.*

- Avoid massing shrubs at the bases of trees or adjacent to structures, especially under eaves, overhangs, windows, or decks.

- Trellises, gazebos, sheds, and other structures should be located in such a way that they do not serve as a path for fire. Construction materials and methods for these structures should be as fire-resistant as for homes. Trellises, for example, can be made of steel, and roofs of gazebos and sheds should meet roofing standards for homes.

- Space trees so that at maturity their crowns are fifteen feet apart or more. The greater the spacing between trees, the less likely that fire will spread from one to another.

*Well maintained plants suited to the climate are more resistant to fire.*

- Choose plants that perform well in your climate and microclimate, and group plants that require similar amounts of water so that different kinds of plants can be irrigated appropriately. Select and locate plants with regard for their preference for shade or sun and their tolerance of frost, heat, and soil types. Healthy plants are more fire resistant than plants struggling to survive.

- Choose plants that will grow to a size appropriate for their location, and locate them so that excessive pruning is not required to maintain desired spacing.

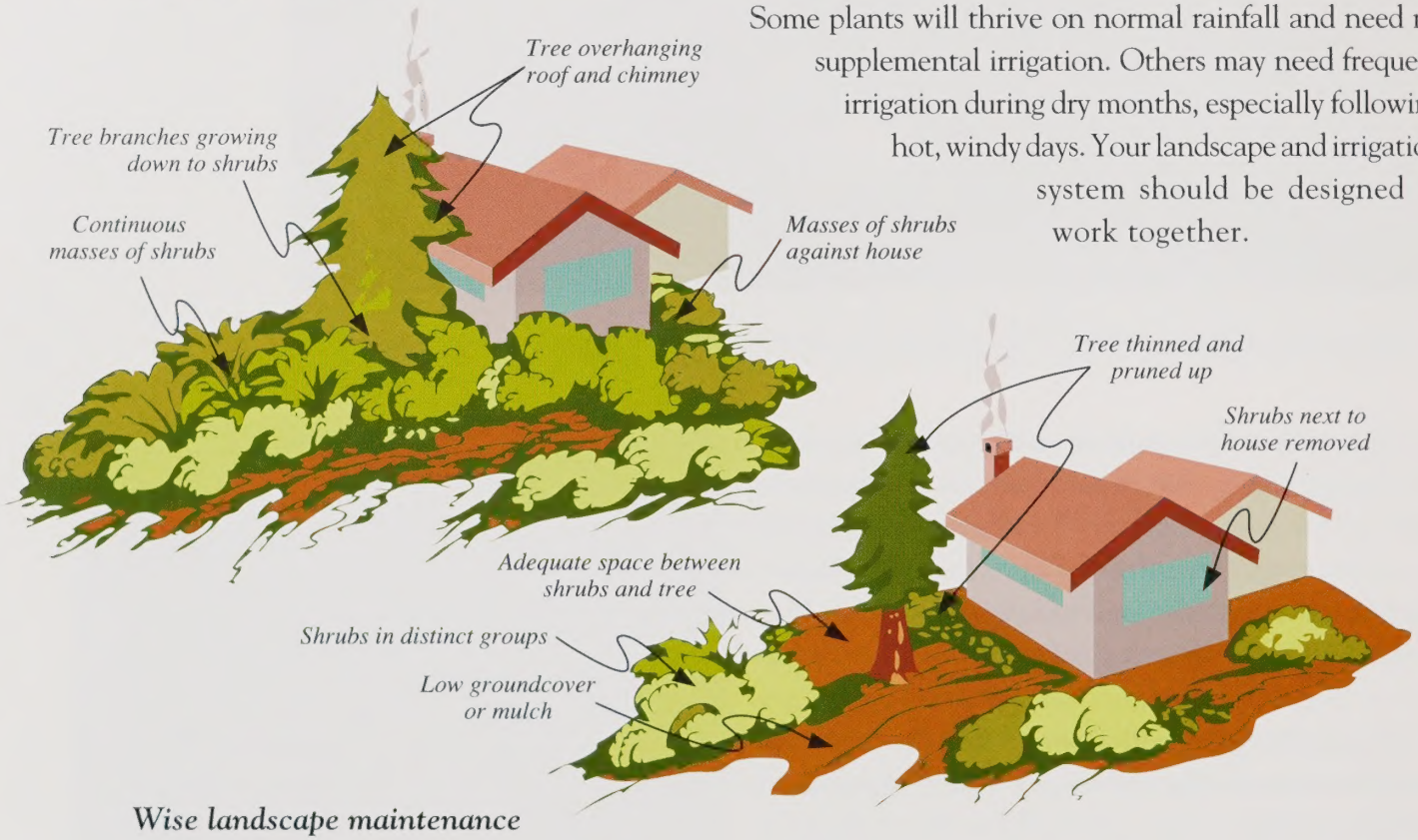
- Don't plant invasive species, which spread rapidly into wildland areas and add to the fuel load (see Resources on page 15 for information on invasive plants).

- Use retaining walls to reduce the steepness of slopes below the house. This may slow the spread of fire and also help to prevent erosion and slope instability.

**How your landscape is irrigated makes a difference.** Plants are damaged by too much water as well as by too little. Some plants also can be damaged by water applied at the wrong time of year. Many drought-tolerant plants are naturally dormant in late summer and may be weakened or killed by water applied at this time. Watering more than necessary also can encourage excess growth, which adds to the fuel load. Learn about the water needs of plants in your landscape, and make sure they are watered appropriately.

*Poor landscape maintenance*

Some plants will thrive on normal rainfall and need no supplemental irrigation. Others may need frequent irrigation during dry months, especially following hot, windy days. Your landscape and irrigation system should be designed to work together.




*Wise landscape maintenance*

- Plants with similar water needs should be grouped and separated from other groups of plants with different needs for water.

- If you install an in-ground irrigation system, make sure that plants with different watering regimes are served by separate water lines and control valves so each group can be irrigated appropriately.

Some plants are damaged by overhead watering, while others may be best irrigated with sprinklers. Drip irrigation is best for areas where plants are widely spaced, since watering open areas between plants will encourage the growth of weeds. Conventional or subsurface drip irrigation is often best for slopes, where sprinkler irrigation may cause runoff and erosion.

***Maintenance for fire safety is a year-round task.*** While most disastrous wildfires in California occur during "fire season" in summer and fall, fire can endanger lives and property at any time of year. Also, many plants survive pruning and thinning better in late fall or winter than in spring or summer when they are actively growing. Fire hazard reduction is best worked into the normal property maintenance schedule, with some tasks ongoing, some performed once a year before fire season, and others undertaken every few years as needed. For example:

**Ongoing:**

- Clean up and dispose of leaves, pine needles, and other plant litter
- Remove debris from roof and gutters
- Remove dead plants and dead branches from trees and shrubs
- Remove vines from trees, shrubs, and fences
- Compost or remove debris from the site

**Annually before fire season:**

- Mow annual grasses and weeds to about three inches tall
- Cut back woody perennials and shrubs that accumulate dry material in a single season (e.g., baccharis)
- Thin overgrown vegetation
- Cover woodpiles and clear surrounding vegetation

**Every few years or as needed:**

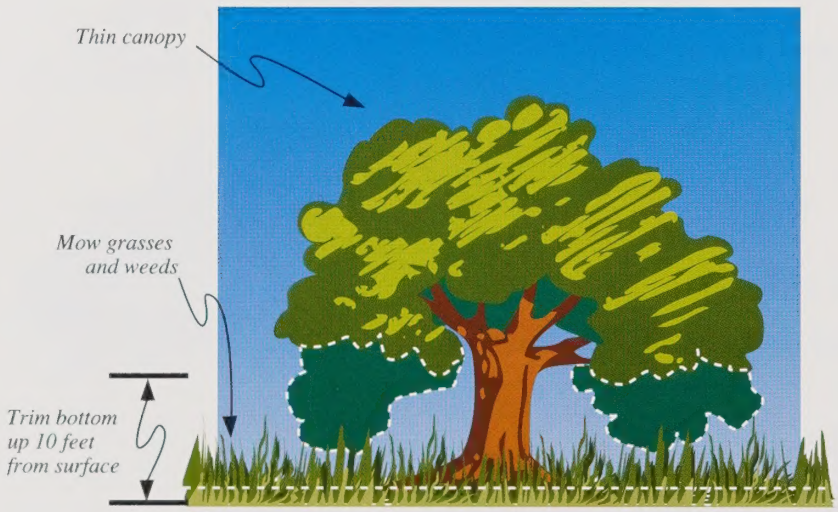
- Cut back vines and low-growing groundcovers (e.g., ivy) to remove build-up of dry stems and dead leaves
- Cut back twiggy shrubs (e.g., baccharis, rosemary) to renew
- Thin and reduce tree canopies to remove twiggy growth, maintain separation between trees, and reduce overall fuel load
- Keep lowest branches of trees pruned up ten to twenty feet, depending on the height of the tree, the height of nearby vegetation, and the distance between them
- Avoid topping trees as this causes excessive branching and twiggy growth that can increase the fire hazard

*Structures and lives are put at risk when accumulated fuels make property damage more likely and fire fighting more difficult.*

## What about fire-resistant plants?

Applied to plants, the term "fire resistant" may be misleading. All plants burn under the right conditions. On hot, windy days, when the ground is dry and plants have little moisture in stems and leaves, fire can race through almost any landscape, threatening homes and lives. If there is any defense against fire in landscaping, it is probably through firewise landscape design and maintenance rather than plant selection.

There are factors that make a plant more likely to burn and carry fire. Some of these are low moisture content, high surface-area-to-volume ratio, high oil content, and the genetic tendency to accumulate dead leaves and stems within the plant and "duff" or partly decayed organic matter on the ground. Most of these factors can be mitigated by careful siting, regular maintenance, and appropriate irrigation.




***Proper maintenance is key to fire resistance.***

There are many lists of "fire-resistant" and "fire-prone" plants, but these are often contradictory and most rely heavily on professional opinion and anecdotal information. Some controlled tests of plant flammability and fire performance have been conducted, and better information may become available over time.

Nonetheless, it is wise to remember that a poorly maintained or inappropriately sited "fire-resistant" plant may be more hazardous during a wildfire than a well maintained and properly located "fire-prone" plant.

## *Questions to consider when selecting plants for fire-safe landscapes are:*

- How large will this plant grow? (affects flame length, fuel load, and maintenance requirements)
- Will it thrive where it will be planted? (affects health and vigor, flammability)
- Will it require more maintenance than can be provided, now or in the future? (affects fuel load)
- Is it invasive? (affects fuel load over wide areas)

Homeowners, landscape designers, maintenance personnel, and public works officials are all, unavoidably, stewards of the land. When we plant a tree or a shrub, we are making a decision that may affect a widening circle of people over a long period of time.

- If the plant we select grows too large or too fast, if it is invasive, or if it is poorly suited to its location, we are creating a maintenance requirement for those who come after us as well as for ourselves.

- Even if maintenance can be guaranteed now and in the future, constant pruning of the plant and its eventual removal add to the biomass that threatens to overwhelm our landfills.

- If the plant is invasive, the maintenance and biomass burdens can extend across property lines, ultimately covering many acres or square miles. Once the most invasive plants are well established over a large area, they cannot be eliminated and require an enormous investment in ongoing maintenance to achieve even moderate control.

Thoughtful and informed plant selection and siting can reduce the threat of wildfire, cut maintenance costs, and help solve the growing problem of biomass disposal not only on our own properties, but in our neighborhoods and on a regional scale.

*The key characteristics affecting fire performance of plants – regardless of species – are the size of the plant, the proportion of fine material, and moisture content.*

## Checklist

**When building or renovating a structure:**

- Site the structure on the most level portion of the lot, well back from the top of steep slopes.

*Gravel walkway, water garden and stucco walls provide some protection against wild fire.*

- Design and locate structures in ways that do not provide easy access for fire.
- Use construction methods and materials that resist combustion.

**When installing or renovating a landscape:**

- Consider fire hazards on and adjacent to the site, in the neighborhood, and in the local area.
- Develop a landscape plan that minimizes fuel load adjacent to structures, on slopes, and in the path of fire that could approach from neighboring properties.
- Incorporate fuel breaks into the landscape design by firewise placement of driveways, patios, paths, and pools.
- Anticipate the ultimate size of trees and shrubs. Select and place them in ways that minimize maintenance problems and fire hazards at maturity.

**Ongoing maintenance:**

- Maintain landscape plants in ways and at times that enhance vigor and minimize fire hazard.
- Watch for build-up in fuel volume over time and through the seasons and take steps to reduce it.
- Clean up and dispose of debris promptly.
- Inspect structures regularly and make repairs to correct any fire hazards identified.
- Make sure that your street address is clearly visible both day and night and that access to your home is not obstructed.

## Publications

**How Can We Live With Wildland Fire?** Available from University of California, Davis, Department of Human and Community Development, 1 Shields Ave., Davis, CA 95616. 44pp.

**California Wildfire Landscaping.** By Maureen Gilmer, Dallas, TX, Taylor Publishing, 1994. 164pp.

**Fire Safe Council Brochure.** This brochure and other fire safety materials are available online at (https://cafiresafecouncil.org/resources/fire-safety-information-for-residents/)

**Fire Performance of Landscape Plants,** by Matthew Gene Etlinger, Master's thesis, University of California, Berkeley, 2000. This study measured various characteristics of plants, then burned the plants under controlled conditions and compared fire test results with plant characteristics.

**Introduction to Wildland Fire** (2nd ed.), by Stephen J. Pyne, New York, John Wiley and Sons, 1996.

**The Defensible Space and Healthy Forest Handbook: A Guide to Reducing the Wildfire Threat.** Available from Placer County RCD, 251 Auburn Ravine Rd., Ste. 201, Auburn, CA 95603.

(The above information is current as of 09/02/2020)

## Agencies and Organizations

**California Department of Forestry and Fire Protection**
(https://www.fire.ca.gov/programs/communications/)
CDF promotes firewise land management in wildland areas.

**California Invasive Plant Council (CAL-IPC)**
(https://www.cal-ipc.org/)
Mission is to protect California's lands and waters from ecologically-damaging invasive plants through science, education and policy.

**California Fire Safe Council**
(https://cafiresafecouncil.org/)
A coalition of public organizations and private firms with an interest in wildfire prevention and loss mitigation through pre-fire management. Local Fire Safe Councils help implement the California Fire Plan by organizing community efforts.

**California Forest Stewardship Program**
(http://calfire.ca.gov/foreststeward/index)
This CDF program promotes good stewardship of privately owned forest land. The Forest Stewardship Helpline (1-800-738-TREE) can answer questions and provide referrals on any forest-related topic.

**California Office of the State Fire Marshall**
(http://osfm.fire.ca.gov)
The mission of the State Fire Marshall is to protect life and property through the development and application of fire prevention engineering, education and enforcement.

**Firewise Program**
(www.firewise.org)
A cooperative program of the US Forest Service and other federal agencies with an interest in management of wildfires.

**National Wildfire Coordinating Group** (www.nwcg.gov)
Coordinates programs of participating federal agencies with an interest in wildland fire management.

**University of California Forest Research and Outreach**
(http://ucanr.edu/sites/forestry/forest_products)
The UC Forest Products Laboratory tests the fire performance of construction materials.

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## Resources

### Agencies and Organizations

**California Department of Forestry and Fire Protection** *(www.fire.ca.gov)*
CDF promotes firewise land management in wildland areas. Printed materials, including *Fire Safe – Inside and Out*, are available from CDF Headquarters, 1416 Ninth Street, P.O. Box 944246, Sacramento, CA 94244, (916) 653-9952.

**California Exotic Pest Plant Council** *(www.caleppc.org)*
CalEPPC is a non-profit organization dedicated to studying and finding solutions to problems caused by non-native pest plant invasions in the state's natural areas.

**California Fire Safe Council** *(www.firesafecouncil.org)*
A coalition of public organizations and private firms with an interest in wildfire prevention and loss mitigation through pre-fire management. Local Fire Safe Councils help implement the California Fire Plan by organizing community efforts.

**California Forest Stewardship Program** *(www.ceres.ca.gov/foreststeward)*
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**California Office of the State Fire Marshal** *(http://osfm.fire.ca.gov)*
This office supports the CDF's mission through testing and listing of building materials, evaluating and recommending standards for building and fire codes, and public education about fire safety.

**Firewise Program** *(www.firewise.org)*
A cooperative program of the US Forest Service and other federal agencies with an interest in management of wildfires.

**National Wildfire Coordinating Group** *(www.nwcg.gov)*
Coordinates programs of participating federal agencies with an interest in wildland fire management.

**University of California Forest Products Laboratory** *(www.ucfpl.ucop.edu)*
The UC Forest Products Laboratory tests the fire performance of construction materials.

***Reduce fuel volume by trimming weeds before fire season starts.***

***How Can We Live With Wildland Fire?*** Available from University of California, Davis, Department of Human and Community Development, 1 Shields Avenue, Davis CA 95616. 44pp.

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